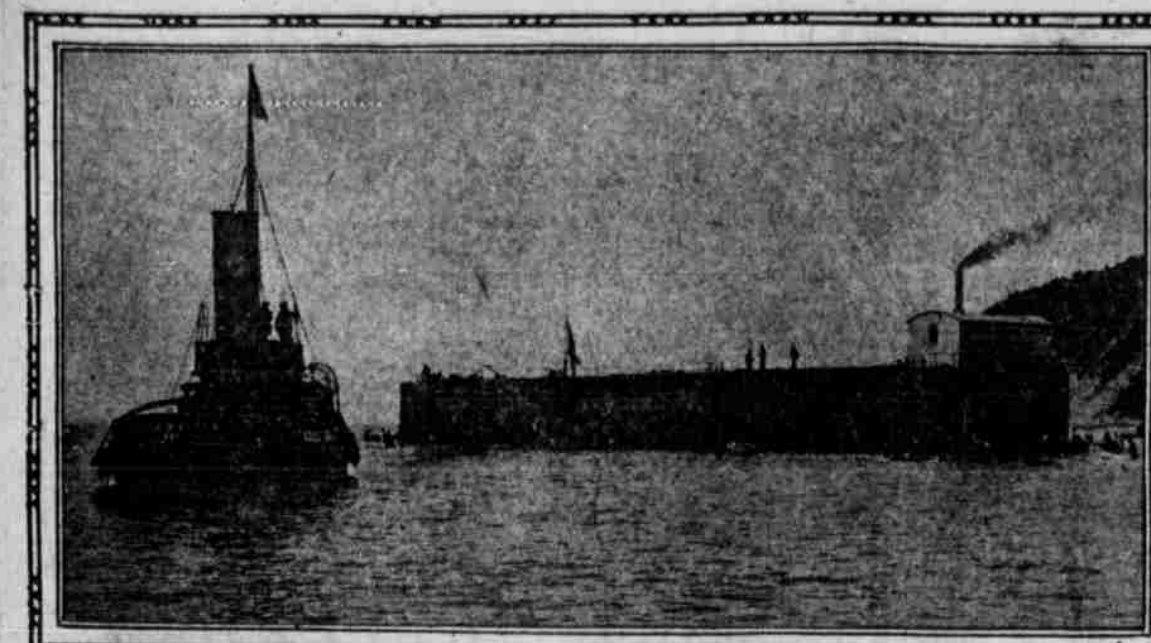
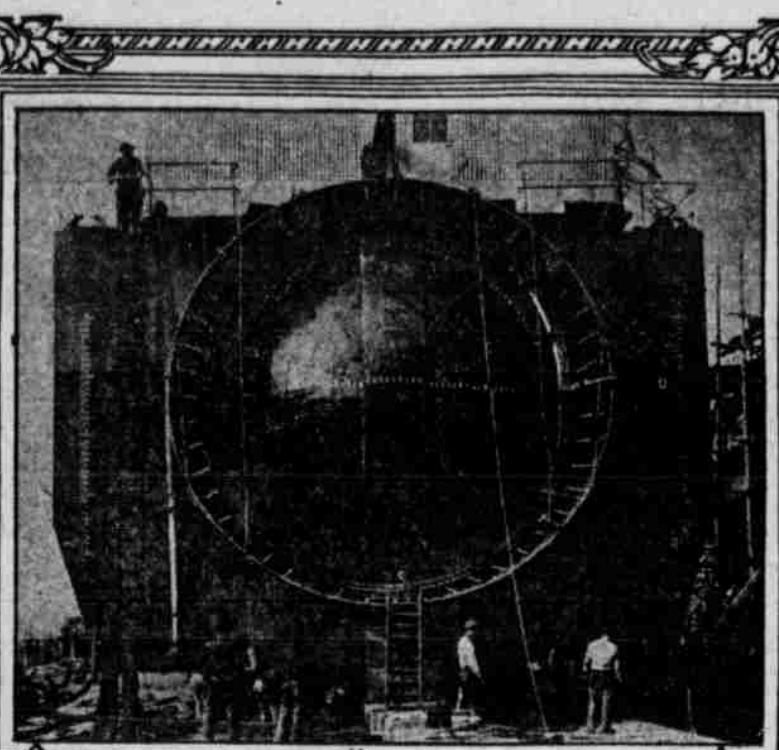


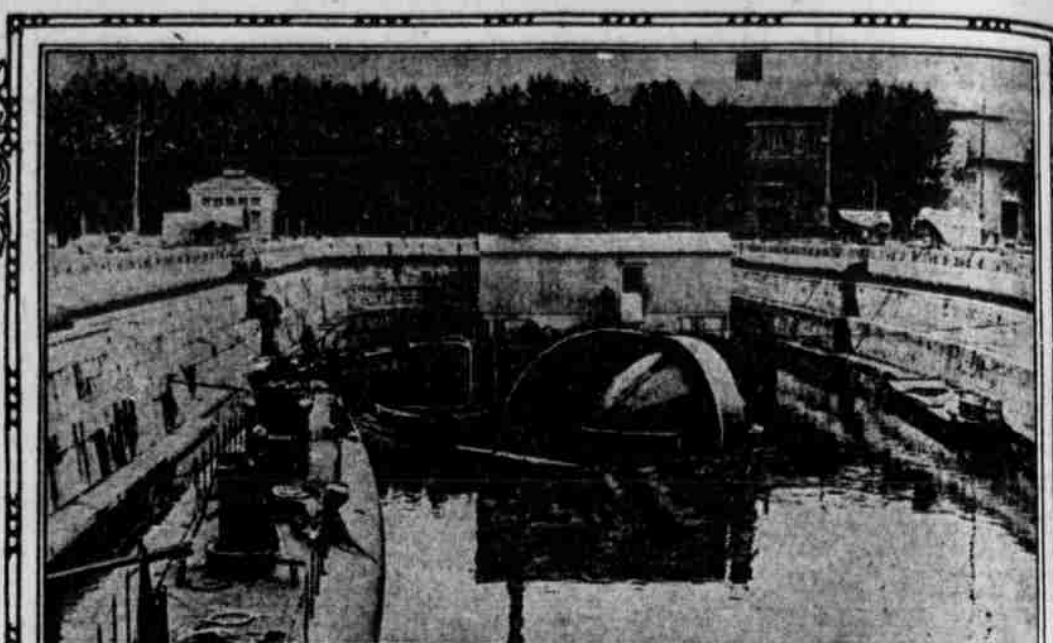
# Germany's Submarine Testing Dock an Object Lesson for Us



The ITALIAN TESTING DOCK FOR SUBMARINES AFLOAT. IT IS EQUIPPED WITH ITS OWN POWER PLANT BUT IS NOT SELF-PROPELLING.



A CLOSE-UP VIEW OF THE BUSINESS END OF THE DOCK, SHOWING THE GREAT GLOBULAR CAISSON IN PLACE AND SEALED.



The STOPPER OR CAISSON OF THE TESTING DOCK SWINGING ASIDE TO ADMIT THE SUBMARINE ON THE LEFT FOR TESTING.

## Italian Invention Adopted by Germans Halted Enormous Sacrifice of Lives and U-Boats—Rejected by Daniels —Fatal Accidents to Our Un- dersea Craft Show Need of Equipment

ONE of the spoils of war which the British authorities are exhibiting to a wondering public is a German U-boat testing dock; and the inquiring citizen is informed that this particular craft was one of the agencies that made it possible for the Germans to test their submarines.

Instead of being the novelty described by English papers, the U-boat dock at Harwich is in principle nothing more nor less than an adaptation, an infringement of a patented submarine auxiliary developed some years before the war by that ingenious engineer, Major Cesare Laurenti. When hard put to it, as the Kaiser's Admiralty undoubtedly was, the technicians of the Imperial Ministry of Marine did not hesitate to crib the ideas of the Italian inventor. They modified the original design somewhat to suit the circumstances peculiar to the German coast off which the dock was expected to act at times.

That is to say, the structure was made more seaworthy so that it might play its part in salvage work off shore, if necessary.

**Poor Construction Costs Lives.**

Something less than two years ago, it was officially stated in England that many Teuton U-boats had been lost on account of structural weaknesses. That is to say, because of the haste in which they were built defects were overlooked and the invited disaster when the vessels got out in the open ocean and were called upon to make deep dives to avoid the ceaselessly watchful destroyers and other anti-submarine craft. This was probably true of the Kaiser's sea ships turned out during the earlier years of the war, but bitter experience, the sacrifice of crews and boats, brought home to Admiral Tirpitz and his followers that the war could never be won by throwing away precious lives and material. Aside from that, the needless hazards courted in this way provoked discontent and even mutiny.

Accordingly, one or more testing docks were constructed. These were used thereafter continually for the purpose of trying out the submarines in the security of Germany's harbors and yet under conditions that simulated up to a point the physical stresses characteristic of maximum designed submergence in the hostile zones of action. Besides this, the docks were planned to serve as salvage auxiliaries in raising U-boats that could be reached without much fear of interference from British patrolling flotillas.

Thereafter, every Teuton underwater craft was thus carefully examined in perfect safety before she was sent forth upon her maiden voyage and, likewise, from time to time she was quickly and effectively tested after a trying period of sea service—particularly if her hull had been wrecked by collision with the seabed or violently shaken by the detonations of powerful depth bombs. There is every reason to believe that few if any U-boats were lost by reason of physical shortcomings or imperfect workmanship subsequently to the providing of this special type of docks. This fact is one that should be of great interest to every American that has the welfare of our own submarine flotillas and their personnel at heart.

Unfortunately, we have nothing akin to this sort of testing and salvage equipment, and this lack is one that may cost us dear at any time.

**Our Own Deficiency.**

The Navy Department has not been unaware of our deficiency, but has made only one effort to fill the gap and then strangely asked to have the fund provided applied in a different direction. To be specific, Congress, by the naval appropriation bill of March 4, 1913, contained this item: "For construction or purchase of a testing and wrecking pontoon for submarines, to be available until expended, \$300,000." A little less than a year later Mr. Daniels asked authority to abandon the building of the so-called "wrecking pontoon" and to be allowed to use the money instead on submarine boats. It is worth while quoting

somewhat freely from his letter on this subject to the chairman of the Committee on Naval Affairs of the House of Representatives. It emphasizes our own lack and makes equally clear the curiously illogical reasons for giving up the idea of adding so valuable an adjunct to our fighting fleet.

Mr. Daniels wrote: "The question of foreign submarine salvage vessels has been gone into very carefully with the Office of Naval Intelligence during the last few months. Considering the question of salvage vessels and testing docks, or pontoons in general, it is to be noted that practically all foreign navies equipped with many submarines have built some form of salvage vessel for the purpose of raising damaged submarines. These are essentially vessels with strong lifting gear. As far as testing pontoons are concerned, so far as the Department is aware, only two are in existence. The Fiat-San Giorgio in Italy has one, in which they test the hulls of submarines built at their works. In addition, a combination testing pontoon and tender for submarines for Brazil is being built by the same company.

"In the case of the proposed pontoon for which one bid has been received, its essential object, aside from possible use as a salvage vessel, is to test the hulls of submarines. Considering the expense of salvage features, it is true that in one successful operation it might easily justify its whole cost. However, should we buy the pontoon as offered, no wrecking gear is installed, the arrangements for such installation only being made. It is proposed to install this gear at Government expense after delivery, and this would cost very considerably and take some length of time.

**Offers Further Objections.**

"Further, with our great length of coast line, and with the submarines scattered by groups along it, in the Atlantic from Boston to Cristobal, and in the Pacific from Puget Sound to Canal Zone on one hand and Manila and Honolulu on the other, it seems very doubtful that in the event of an accident a single powerful salvage vessel would be where it was wanted. Further, to require that a proposed wrecking vessel should be in the vicinity of where submarines are operating would tend to restrict and hamper their radius of action, which is now great and constantly increasing.

"Next, considering the use of this pontoon in testing the hulls of submarines, the submarines to be tested may be divided into two groups, (1) old submarines and (2) new submarines. The old submarines, i. e., submarines in service, will be tested purely for information and to insure that they are strong for operation. It is the intention that this pontoon if built shall be stationed on the Atlantic coast. The submarines in service or soon to be in service on the Atlantic coast would be the only ones, therefore, available for test. These vessels have all either recently been tested or would have had their test shortly before the completion of the pontoon. In other words, none of the boats in service available for test by the pontoon would need a retest under ordinary circumstances for from three to five years.

"There remains, therefore, only group (2)—new submarines. The pontoon if built would be used in testing these submarines in place of submerging them to the test depth of 200 feet, as required by contract. In the past and until quite recently the cost of this operation of submerging has been comparatively great. One of the principal objects in purchasing this pontoon was to save the Government this cost, which was of course included in the contract price of submarines. However, as advance in submarine boat construction has increased the confidence in the strength and workmanship of these boats, the operation has been carried out by the contractors in a way that in the recent boats has very materially decreased the cost. Moreover, within the last few months the future building of some high speed submarines has been practically decided upon. The dimensions of these boats in all probability will be such that they could not be tested in this pontoon.

"Summing up the facts outlined, i. e., the use to which the pontoon would be put, the probability of not being able to use it for salvage in the event of ac-

cident, its original first cost, its inadequacy for tests of the larger submarines of the future, and the fact that we have only one bidder for a device of special type and one little used abroad, the Department has directed that contract be not awarded for this pontoon, that the bid be rejected and that the requisition be cancelled. . . . The Department is strongly of the opinion that this appropriation could be much better used in new submarine construction than in the construction of the testing pontoon."

Briefly, to carry out the same reasoning, Mr. Daniels would not favor the building of a drydock for battle craft because the money available would not cover the cost of a dock large enough to take care of ships about to be constructed, quite regardless of the needs of those already in service. All he had to do was to ask for more money so that the contemplated salvage and testing craft for submarines could have been made of ample size to accommodate any under water boat under advisement.

Again, the Secretary of the Navy

made a grievous mistake in assuming that a submarine once tested, would not require retesting for from three to five years. There are many things—among them split acids, the corrosive action of sea water and other agencies common to ordinary wear and tear—that tend to affect the soundness and strength of steel work in parts of submersible craft that are difficult if not well nigh impossible to inspect at frequent intervals. And yet provision should be made by which these insidious and developing weaknesses could be discovered without hazarding the lives of all on board.

It was just this state of affairs, brought home to the Germans by wartime stress, that impelled them to do that very thing which Mr. Daniels failed to do when funds were at his disposal. What is more the navy's lack of a salvage craft of this character was painfully emphasized in March of 1915, when the F-4 went to the bottom outside of the harbor of Honolulu. It is probably no exaggeration to say that that boat might never have been lost had she been tested for hull weaknesses of one sort or another.

It is absolutely certain that she could have been recovered promptly had appropriate equipment been available at that station. As it was, months went by before the F-4 was raised to the surface, and to achieve this she was so roughly hauled in getting her into shallow water that it was out of the question to establish the primary cause of her fatal plunge.

A surface boat must be docked at reasonably frequent intervals for the purpose of examining her bottom and to discover the condition of the outboard ends of all sea connections. Any board ends of a vessel making certain sign of deterioration or weakness must be dealt with at once in order that the vessel may ride the waves with reasonable security. All the more, then, should a submarine be examined often because of the hazards of her service, and her tests should be of a nature that will simulate deep water work and the physical forces that come into play when either by accident or purpose she is submerged to a depth of quite 200 feet.

Simply because of the expense involved, not to mention some difficulties, it has not been the practice with

us to retest our boats by deep submergence, relying for the most part upon the original contract performance. Unhappily under this procedure accident, minor or otherwise, alone reveals how dangerously and unwittingly the margin of safety may be reduced.

In ordinary operations the submarine commander is not called upon to go deeper than a hundred feet, and as a rule a sixty foot submergence suffices for most military purposes. But even so the officer in charge should have some way of making certain just once so often that his boat is in prime condition and that he could be carried down 200 feet without fear of structural ruptures that would entail a disaster.

It is not an easy thing along wide stretches of the Atlantic seaboard, for instance, to find sheltered water 200 feet deep for the testing of our submarines. In Long Island Sound there are some spots where this is available, but this is not convenient to the submarines stationed further southward. Again, a "swimming hole," so to speak, of the necessary depth exists

up on the coast of Maine near the little town of Castine, and some of our submarines go there for their deep water tests. Wouldn't it be a far simpler matter, aside from a gain in security, to have a mobile testing dock or docks which could be shifted from time to time to the different submarine bases located along our seaboard?

The manner in which we do this work now, the most approved way, is to plant a big block of concrete, weighing a score of more tons, at the point where the trial is to be carried out. This cement anchor has a ring in it through which a cable attached to the submarine can be drawn, and then the under water craft, duly ballasted, but with a goodly measure of reserve buoyancy, is forcibly pulled under water by means of a steam driven windlass on a surface craft. Sometimes the initial submergence is made without anybody inside, and then after the submarine's return to the surface observers go inside, the boat is pulled down, once more and these men make certain examinations or tests. Days may be required to carry out these various operations, especially if stormy weather interferes, and inevitably the craft must be taken away from the building yard or base—possibly hundreds of miles.

The safety of a submerged submarine is not alone dependent upon the soundness of her pressure resisting hull. Her return to the surface after resting on the bottom may hinge upon the effective working of two ballast control mediums: first the compressed air system, by which certain of her tanks can be emptied of water, and second, power driven pumps which supplement the air line. The latter must be able to discharge against a "head" of 200 feet, and their efficient working can be satisfactorily established only by operating them at that depth. The ordinary test at the surface does not reveal some defects that may prove fatal if the pumps be called upon to function far down in the ocean.

**A Close Call.**

Something like a year or so ago one of the ranking officers of the navy died of pneumonia because of an unexpected spill into the cold sea. The small craft in which he was travelling at the surface was unexpectedly and disastrously bumped into by an emerging submarine. The latter vessel had been carried deeper than was the intention of her commander, and she failed to work properly and her water ballast was blown in desperate haste to keep her from going down for good. This was during the submarine's testing. How many similar close calls other American under water boats have had has not been disclosed by the authorities, but the real story back of one record breaking exploit will suffice to make it plain how grave are the risks run at times.

The big submarine in question was making preliminary trials in Long Island Sound preparatory to her deep water test. For the tryout her navigator chose an area where the chart indicated a depth of not more than 200 feet. Every well informed layman now knows that submarine craft are mechanically very complex and things can go wrong if not carefully watched—especially in this case when the boat was under consideration; the proposed schedule was upset, the hour set for the submergence came and went and time was lost before she was ready for her dive. During the interval her engines had been running, using up fuel, and the sun was getting

closer and closer to the horizon. Most time slipped by in getting her trim for her dip and during the whole period she drifted away from the testing spot. Herein lay the germ of a near catastrophe.

The type of submarine in question carried her fuel tanks outside of her main or pressure resisting hull. When full these tanks were safe against the crushing force of the sea, but the engines had partly exhausted them and this fact was not heeded. Accordingly they gave the vessel added buoyancy and to just that extent more water had to be taken into the ballast tanks to make the boat submerge. Now what happened when she sank beneath the surface. Without warning she hastened bottomward, but she did not halt where it was expected she would. The submarine had drifted over a lot, 256 feet deep, not 200 feet, and no one realized it until she came to a standstill with the hand of her depth gauge quivering its startling message!

**Falls to Rise.**

At once the usual tanks were blown free of water, but the boat did not rise because that discharge was not sufficient to overcome the unexpectedly increased "negative" buoyancy. Imagine how those men felt. No wonder there was excitement and confusion. True, the boat was not leaking, but neither was she responding as she should have done; she seemed to be glued to the waterbed.

Finally emergency facilities were brought into play and the vessel rose surfaceward, to the infinite relief of every one. Picture what might have happened had she dropped into a still deeper hole! This close shave frequently when our submarines manœuvre, and possible disaster can be guarded against only by making sure that the hull is absolutely sound and that the none of the sea valves, etc., is effective. And how does a testing dock like that designed by Major Laurenti and copied by the Germans, insure against preventable mishaps?

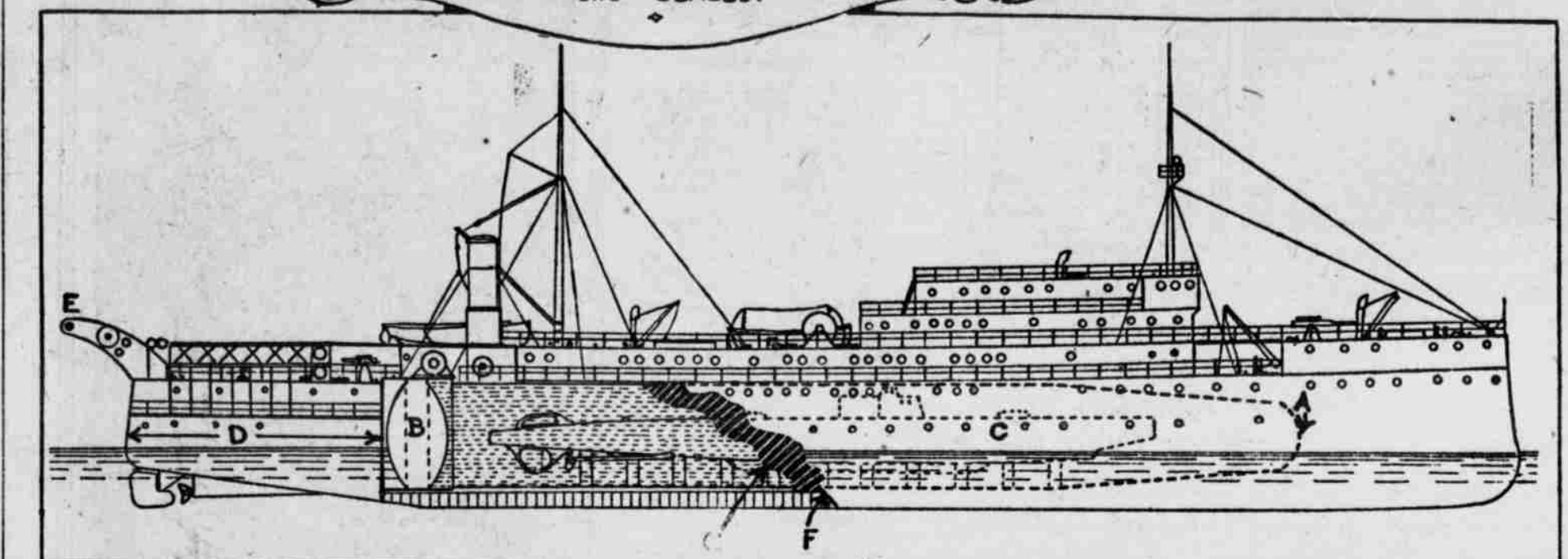
He does it by permitting the submarine to be tested in port, either at a naval base or a building yard, under conditions that are no more trouble some than those incidental to the working of the usual dry dock. All that is necessary is that there shall be a sufficient depth of water to submerge the entrance to the testing dock far enough to permit the underwater boat to be floated into the steel cylinder which constitutes the unique feature of the structure. The cylinder is then sealed and made tight just like a cork pressed firmly into the mouth of a bottle. When the submarine has entered the cylinder and has been duly centered, so that it cannot shift in any direction, the water tube is filled with water which completely envelops the contained craft. Then, by means of pumps, the pressure exerted by this water is gradually raised so that the submarine is subjected to a crushing force which can be made to correspond to that of actual submergence in the sea.

**Tests Quickly Made.**

All the while, men inside of her call watch for the slightest leak and locate it promptly, and they can also by means of suitable instruments detect any deformation of the hull and whether or not the structure is permanently affected or returns to its erstwhile form when the external pressure is relieved. They can likewise work the boat's pumps and other things that show just how the mechanisms will function under service conditions at any designed submergence. At a moment's notice the hydrostatic stress of the surrounding water can be dropped, because the divers within the craft have the valves touched, by telephone, with the engine in charge of the external operations.

With facilities of this sort available submarines can be tested quickly and easily. The Germans have proved that it is well worth while to have such facilities of this kind, and they have similarly demonstrated that they can deal with the biggest of modern subaqueous torpedo vessels.

Our own submarine flotillas cannot be kept efficient and cannot be examined periodically, as they should be, unless we too provide ourselves with kindred means to greater security. The Italians have developed even a more up to date submarine auxiliary in the shape of a combined wrecking tender and testing dock capable of travelling thousands of miles. The tender or depot ship is also a mobile repair base, supply craft and source of relief crews for the wrecked personnel of the active boats of the flotilla.



A DEPOT SHIP FITTED WITH AN INTERNAL TESTING DOCK FOR SUBMARINES. A—TESTING DOCK, B—CAISSON FOR SEALING OUTBOARD END, C—SUBMARINE INSIDE, D—PORT HALF OF CATAMARAN STERN WHICH FORMS A PASSAGEWAY, E—WRECKING DERRICK FOR SALVAGING OF SUNKEN SUBMARINE, F—OUTER SKIN OF DEPOT SHIP, G—INNER SKIN.

## How War Jolted the Sullivan Law

I HADN'T been so many years ago that you could have your political opponent or your grammar-school neighbor permanently and promptly eliminated in a business like manner by gentlemen who made killing a profession. For a stipulated sum and a reasonable assurance of immunity, any one of twenty gang leaders would agree to free you from the discomfort represented by said opponent or neighbor.

The hired killer plucked his revolver from his coat or hip pocket and inspected it. Finding it all that it should be from a standpoint of efficiency, your gangster located his victim, took careful aim from some such secluded spot as a window or a doorway and there you were. The morning newspaper made mention of the mysterious shooting and you pursued the even tenor of your way free from further embarrassment.

That was in the days when it was not only easy to procure firearms in the State of New York, but no one had any particular interest in whether you carried your gat with you or left it at home. Just so long as you didn't shoot, the police weren't at all concerned.

**The Sullivan Law.**

But the Sullivan law was adopted. The Sullivan law not only made the possession of firearms amenable to its punishment clause, but designated any person who sold such weapons to any one not possessed of a proper permit. Those citizens who possessed firearms were cautioned to report such ownership to Police Headquarters and, if Police Headquarters deemed it wisdom to allow the registrant to retain the pistol or revolver or whatever it chanced to be, the citizen was given a permit for which he paid a few dollars.

Doubtless the Sullivan law had its effect. It did not stop gang shootings nor did it stop the acquisition or the ownership of firearms. Furthermore it was used illegitimately by police. A few unfortunate citizens

against whom somebody with influence had a grudge were arrested on trumped up charges and when searched in the police station were found to have one or more revolvers in their possession. It made no difference whether the revolvers were in those pockets when the man was arrested. The fact remained that he was guilty of a violation of the Sullivan law. The police said so and he might squall himself into apoplexy for all the good protest was of avail to him. In brief, the gentleman had been framed and the guns planted and he went to jail and his enemies made merry.

But, largely considered, the Sullivan law was an excellent bit of legislation. If it did nothing else it made the acquisition of a revolver rather harder of accomplishment and gunmen were a trifle chary of toting their artillery about the streets.

Inasmuch as the World War was fought out with a fine disregard for

law, order and such, such rules as the Sullivan law were more or less ignored in Europe, where there never was anything approximating such a law anyway. Every officer and almost every non-commissioned officer was armed with a revolver.

Regulations specify that all officers but only certain N. C. Os shall carry pistols or revolvers. But before the armistice went into effect virtually every N. C. O. and about fifty per cent of all privates owned either an automatic or a revolver—most of them with a tremendous amount of persuasion about them.

And when they returned to the United States a great majority of them fetched the gat along. It wasn't difficult for the officer. He had his bed-room trunk or locker trunk or both and therein he carried his artillery. The embarkation and disembarkation inspections of the equipment of enlisted men divorced them from their beloved gats if they were so foolish as to dis-

play them. But one is not a soldier very long before one becomes an adept at the business of getting away with things and putting things over.

Any N. C. O. knew some officer who would carry home the coveted weapon in his personal baggage. The same went for the privates. Then there are other ways of cheating the inspecting officers. But such evasion of military law is neither here nor there. Other States beside New York have anti-firearm laws, and the point of this story touches these communities as well as New York.

As a result of the importation of these small arms there exist in New York to-day about 5,000 violations of the Sullivan law. It is estimated that scattered throughout New York city alone there are 5,000 pistols, revolvers and rifles, all of them in excellent working condition and not one of them registered or covered by a permit. Reference is made only to those brought over by troops. How many there are outside this category is not considered here.

**Many Kinds Represented.**

These firearms are to be classified variously.

There are the automatics and six-shooters that are the personal property of the officers who possess them. Then there are the salvaged gats smuggled in by officers and men alike. Then the souvenirs of Lugers and Mausers and the Austrian, Italian and British pistols that could be picked up in France and Belgium any day by anybody on the front.

Next come the short cavalry carbines of the French and Belgian armies and the neat, efficient rifles of the German troops. These rifles were not so long as the Springfield or the Enfield and could be and were smuggled across the ocean in considerable numbers and sundry ways.

Just what the police are going to do about all this is up to the police. Recent reports of small robberies have shown that burglars do not fail to take revolvers and pistols as well as silver and money. And while there is no indication that a crime wave or a revival of the old gangster days will come to pass as a result of this sudden importation of service weapons, the fact remains that the Sullivan law has received a considerable jolt.

## Vienna's "Favoriten" District

IN the district known as "Favoriten" (which name was derived from the Imperial summer palace "Favorita"), the Maria Josefa Park lies, situated upon the top of a rather high incline, near the city of Vienna. The gardens surrounding it were laid out at the instigation of Karl Lueger, to whom much credit is given for artistic designing.

Back of the Maria Josefa is the Arsenal, which was erected in 1849-55 to replace the old one, then termed the Rudolfs. This structure is a source of inspiration to students who come to familiarize themselves with its rare workmanship.

At the time of the proposal of the building of the present Arsenal much competition arose as to which great architect should be awarded the privilege of drawing the plans. After many suggestions by Van der Noll, Siccardus, Hansen, Forster and Romen, it was decided that all their ideas be placed together in the final construc-

tion. Therefore, with their combined skill the Arsenal is noted for its exterior, costing no less than eighteen and three-quarter million crowns.

The main entrance has two doors of heavily filled-in ironwork, with the accompanying strong bolts in evidence. Three open arched doorways act as a small rampart above, and still higher, is the iron statue of a "man at arms." Evenly apportioned off as side issues are short towers with their flat roofs reserved for sentry duty. Close to the top of each of these are four additional statues of soldiers equipped with helmets and swords.

The entire building is but two stories in height, with the exception of the central section which has an extra storage floor for old guns, batteries, etc.

Its most imposing possession, however, is the high square tower from which the once prized flag of Austria floated. Inside its walls there is ample space for three regiments of artillery and their armament. Artillery workshops are also built within the arsenal, and some trophies taken in previous wars are in the Hall of Fame.